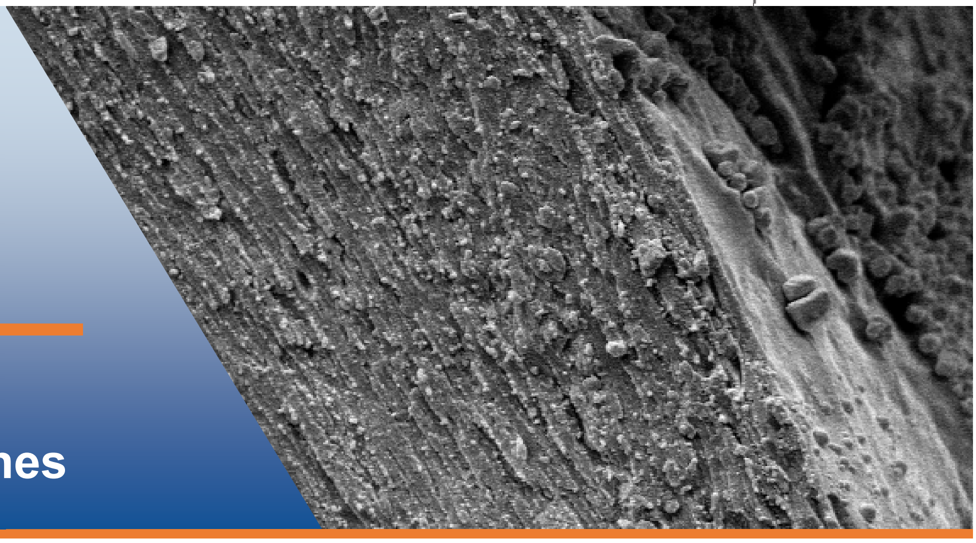
UNIVERSITY OF CAMBRIDGE enterprise

Cambridge Centre for Medical Materials



A new class of

Collagen Membranes

A new **collagen membrane technology** has been developed that has the potential to allow for a range of benefits, including the ability to make much **larger collagen membranes** than those currently available on the market**,** where membranes can be made to any **desired thickness and adopt any desired shape**, that are **resistant to suture pull-out** and which can sustain **live cells for regenerative applications**. Professor Ruth Cameron, Professor Serena Best and their team from the University of Cambridge's Centre for Medical Materials have developed and patented this method of collagen membrane production and the team are now keen to collaborate with partners to develop applications for this technology.

Key Benefits

- Membranes produced to any size, texture and thickness
- Curved, shaped, and seamless tubular membranes possible
- Live cells can be embedded to speed recovery
- Membranes may be command set in situ to suit the patient

Background

Collagen is one of the most important biomaterials, and is used today in a range of forms for tissue regeneration, wound healing, orthodontic and barrier functions. Conventional membrane fabrication methods use decellularised animal tissue which limits their size, requiring surgeons to use multiple membranes and preventing their use in larger area wounds such as burns or diabetic ulcers. Additionally, the decellularisation process can damage the structure of the membrane, or fail to remove all traces of the animal, leading to inflammation and rejection.

Many current surgical needs are currently unmet by the collagen membranes available on the market. Membranes with complex shapes, such as curves and tubes are required for maxillofacial and nerve regeneration; controlled, tailored structural alignment is needed to improve toughness for suturing and handling, and live embedded cells are needed to speed recovery and improve surgical outcomes.

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The Technology

This technology is based on electrophoretic deposition, a widely used industrial forming technique that has been modified to allow for rapid fabrication and precise control over a range of important membrane parameters including the **size, thickness and shape** by manipulating the inherently charged nature of biomolecules in suspension using electric fields. By controlling the underlying electrodes, as shown below, it is possible to **fabricate a wide variety of membranes tailored towards specific clinical needs**. Further, these attributes can be combined together as required to produce more complex and targeted products. Additionally, as this technology builds membranes from pure macromolecules it **avoids inherent biocompatibility problems** associated with conventional membranes.

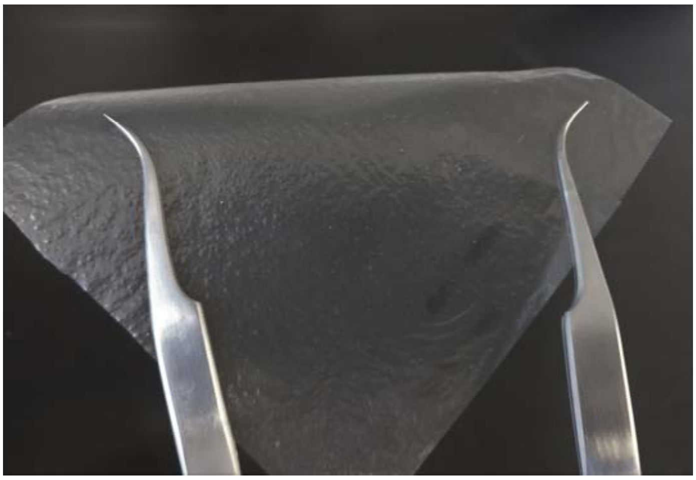


Figure 1: A 10x10 cm defect free collagen membrane produced using our new technology

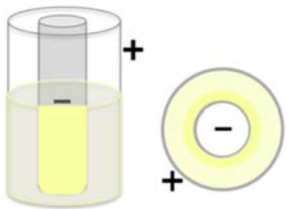
Next steps

A patent application in the UK has been filed, and Cambridge Enterprise is seeking partners for development.

The Inventors

Professor Ruth Cameron, Professor Serena Best, Dr David Barrett and Matthew Linley are based within the Cambridge Centre for Medical Materials.

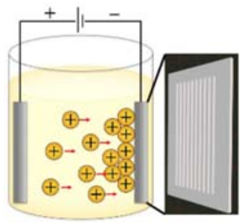
Potential Architectures



Curved / cylindrical electrodes

Makes: shaped membranes, seamless tubes

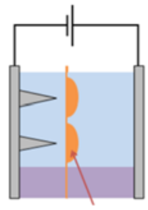
Example uses: maxfacs surgery, nerve guides, vascular grafts



Textured electrodes

Makes: micro- and nano-topography on membrane surface

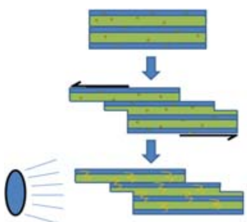
Benefits: cell guidance cues improved biological integration



Off electrode deposition

Makes: topographically structured membranes, surface coatings

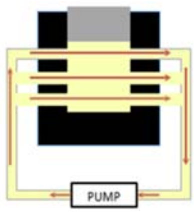
Benefits: cell guidance cues, direct deposition on scaffolds



Command-set multilayers

Makes: deformable membrane stiffened on demand

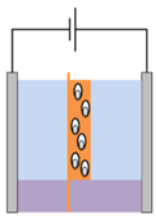
Example use: dental ridge augmentation surgery



Sheared electrodes

Makes: Successive layers with different preferred alignment.

Benefits: enhanced strength, toughness, and suturability.



Live cell incorporation

Makes: membranes with chosen live cell incorporation

Benefits: accelerated healing processes, directed biology